Barstow woolly sunflower (*Eriophyllum mohavense*)

Photo courtesy of Xeric Specialties.

Legal Status

State: None
California Rare Plant Rank: 1B.2[1]
Federal: Bureau of Land Management Sensitive
Critical Habitat: N/A
Recovery Planning: N/A
Notes: In 1993, the U.S. Fish and Wildlife Service (USFWS) determined that proposing to list Barstow woolly sunflower as endangered or threatened may have been appropriate, but sufficient data on biological vulnerability and threat were not available at that time to support a proposed rule (58 FR 51144–51199).

Taxonomy

Barstow woolly sunflower (*Eriophyllum mohavense*) was originally described by Ivan Murray Johnston in 1923 under the synonym *Eremonanus mohavensis* (Johnston 1923; IPNI 2005), but soon included in Eriophyllum by Jepson (1925, p. 1117). Barstow woolly sunflower is in the sunflower family (Asteraceae) (Jepson Flora Project 2011). It is an annual herb standing approximately 1 to 2.5 centimeters (0.4 to 1 inch) in height. A full physical description of the species can be found in The Jepson Flora Project (2011) and Munz (1974).

Distribution

General

This species is endemic to California's Mojave Desert (Jepson Flora Project 2011). Barstow woolly sunflower is restricted to a range within a 30-mile radius of Kramer Junction in San Bernardino and

[1] **1B:** Rare, threatened, or endangered in California and elsewhere; **X.2:** Fairly threatened in California.

Kern Counties. The eastern-most extant location is Barstow, while the westernmost is the town of Mojave, southernmost is El Mirage, and the northernmost is 25.8 mi northeast of Kramer Junction between Almond Mountain and Black Hills (CDFW 2013a). The species' elevation range extends from 2,000 to 3,600 feet (CDFW 2013a). All of the 67 total California Natural Diversity Database (CNDDB) occurrences (at 168 localities) are in the Plan Area (Figure SP-P04).

Distribution and Occurrences within the Plan Area

Historical

There are 168 total CNDDB localities in the Plan Area, approximately 22% (37) of which have been recorded prior to 1990 (CDFW 2013a). Additional occurrences of Barstow woolly sunflower have been extirpated without having been updated in the CNDDB (MacKay, pers. comm. 2012). The historic occurrences extend from the area around Barstow northwest to the Almond Mountains foothills, west to the area around Kramer Junction, and south to Stoddard Mountain (CDFW 2013a).

Recent

The majority of the 134 CNDDB localities recorded since 1990 are located in the vicinity of Kramer Junction on Edwards Air Force Base. Known extant occurrences now extend farther west, approximately 5.5 miles east of the Mojave Airport, and near Buckhorn Lake about 1 mile north of the Kern–Los Angeles County line. New records farther east are from near Opal and Lane Mountains, as well as Barstow (Figure SP-P04). The El Mirage CNDDB occurrence, entered in November 2011, is now the known southernmost occurrence. Of the current localities, approximately 30% are on lands owned by the Department of Defense (DOD) on Edwards Air Force Base, 10% are on Bureau of Land Management (BLM) land, 6% are on lands managed by the CDFW in the West Mojave Desert, and 54% are on lands that are privately owned or are likely privately owned (CDFW 2013a).

Natural History

Habitat Requirements

Barstow woolly sunflower has been observed in openings within chenopod scrub, Mojavean desert scrub, creosote bush scrub, and also occurs on playas (CNPS 2011; Jepson Flora Project 2011). This species has been observed on bare areas with little soil that frequently contain a shallow subsurface caliche layer (BLM 2005) (Table 1). Barstow woolly sunflower often grows in the sandy margins of small "scalds", which are slightly depressed areas (within the preferred vegetation types) with poor drainage that collect water and then evaporate. However, further away from the Kramer Junction/ Edwards Air Force Base areas, it has been reported growing under different edaphic conditions. For example, the easternmost CNDDB location is on a cobbly ridge, north-facing slope, and the occurrence at Opal Mountain is on upland gravelly soil (CDFW 2013a; MacKay, pers. comm. 2012). A 1995 study by the consulting firm, TetraTech, showed that this species tends to occupy soils with more clay in upper layers, higher alkalinity, more boron, and soil of harder consistency than adjacent unoccupied areas (cited in Andre).

Table 1. Habitat Associations for Barstow Woolly Sunflower

Land Cover Type	Habitat Designation	Habitat Parameters	Supporting Information
Chenopod scrub, Mojavean desert scrub, Creosote bush scrub, and Playas	Primary habitat	2,000–3,600 feet	CNPS 2011; CDFW 2013a

Reproduction

Barstow woolly sunflower is a very small annual plant. Duration of flowering is from two to three weeks during the flowering period from March or April to May. Plants then generally go to fruit in May (CNPS 2011; Jepson Flora Project 2011). An 8-year study by Jim Andre in the 1990s showed that seedlings are only established in years of

average or above average precipitation. The study also showed that populations tend to occupy the same places when they do germinate, possibly indicating that there is very limited seed dispersal distance in this species (Andre and Knight 1999). Plants were successfully established off site as mitigation for the Luz solar field project (MacKay, pers. comm. 2012). There is no information available regarding pollinators.

Ecological Relationships

Very little is known about the ecological relationships of Barstow woolly sunflower. Annual species that are most frequently found with Barstow woolly sunflower in the same microhabitat include Mojave spineflower (*Chorizanthe spinosa*) and yellow pepper-grass (*Lepidium flavum*). Mojave spineflower was reported as an associated species is over half of the CNDDB records and yellow pepper-grass was an associated species in several records as well (CDFW 2013a).

Population Status and Trends

Global: G2, Imperiled (NatureServe 2011, Conservation Status last reviewed 2006)
State: S2.2, Imperiled (CDFW 2013b)

The 2012 CNDDB includes 63 occurrences for this species, although this estimate includes occurrences that are historic (prior to 1990) or possibly extirpated (CDFW 2013a). Population trends for this species are unknown at this time, but a multi-year, population-level study is underway by BMP Ecosciences and estimated to conclude in 2015. This is an annual plant with populations that fluctuate greatly (by orders of magnitude) from year to year depending on conditions, and also which have a soil seed bank that also likely shows a remarkable amount of fluctuation. Barstow woolly sunflower responds to water availability in terms of population dynamics (Andre and Knight 1999).

Threats and Environmental Stressors

Threats to Barstow woolly sunflower include military activities, energy and subdivision development, sheep grazing, exotic plant species, off-road vehicle use, highway and road improvements and

building, mining, dumping, and pipeline construction (NatureServe 2010; CNPS 2011; MacKay, pers. comm. 2012). Of these threats, those of primary concern include energy development, military activities, sheep grazing, off-road vehicles, and highway improvements (NatureServe 2010; MacKay, pers. comm. 2012). Energy development includes not only construction of solar and wind power production sites, but also utility corridor construction (e.g., roads, transmission lines) (MacKay, pers. comm. 2012).

Specific effects of energy development include shading from solar panels. Shading can reduce the density of Barstow woolly sunflower by suppressing emergence from the seed bank. In addition, shading from solar panels may kill plants before they flower, thus reducing seed production (Tanner et al. 2014). Shading from solar panels can also decrease species richness (i.e., the number of different species present) and community abundance (i.e., the number of individual plants present) (Tanner et al. 2014).

Several Barstow woolly sunflower sites may be extirpated, but their status has not been reported to the CNDDB; however, it is also important to recognize that these plants may be inactive in some years but persist in the seed bank. Currently, only one CNDDB occurrence is recorded as possibly extirpated (CDFW 2013a). However, CNDDB Occurrences #9 and #10 occur along Highway 58 and a widening project has occurred along this highway that has likely extirpated these occurrences (CDFW 2013a; MacKay, pers. comm. 2012).

Conservation and Management Activities

The BLM has established a 314-acre botanical Area of Critical Environmental Concern (ACEC) northeast of Kramer Junction to protect the Barstow woolly sunflower in the West Mojave Plan Area. In a final West Mojave Plan EIS (BLM 2005), of which Alternative A was adopted by BLM in a March 13, 2006 Record of Decision, the protected area for Barstow Woolly Sunflower was expanded to 36,211 acres. This includes the original 314-acre fenced area (now officially called the Barstow Woolly Sunflower ACEC) plus some adjacent CDFG land (acquired by a land exchange with BLM). Along with some

private inholdings, the entire 36,211 acres makes up the Barstow Woolly Sunflower Conservation Area (BLM 2005; MacKay, pers. comm. 2012). This ACEC has a perimeter fence that offers protection from human impacts. However, the BLM has little staff to police and enforce the area, so it is unclear how much protection the Barstow Woolly Sunflower Conservation Area affords this species (MacKay, pers. comm. 2012).

Management areas at Haystack Butte and Leuhman Ridge on Edwards Air Force Base support Barstow woolly sunflower. Another management area consisting of undeveloped land north of Mercury Boulevard also supports this species (Edwards Air Force Base 2002).

Data Characterization

Little is known about the population status and ecology of Barstow woolly sunflower due to its ephemeral life history. Many of the occurrence points are relatively old and need to be updated (MacKay, pers. comm. 2012). Nearly half (29 of 63) of the CNDDB occurrences were recorded prior to 1990 or are not dated (CDFW 2013a).

Surveys seem only to be done around existing roads and trails, and especially in areas where there are proposed projects. Much more can be discovered by extensive and thorough surveys on public lands, as well as private lands (if permission granted), conducted within the flowering period and in years with average to above-average precipitation.

Management and Monitoring Considerations

Barstow woolly sunflower would likely benefit from the elimination of off-road vehicle use and sheep grazing in occupied areas. In addition, vast areas remain unsurveyed (MacKay, pers. comm. 2012). Focused surveys for this species should be conducted in suitable habitat where it is likely to occur, including investigating the status of records of the species where the status is uncertain and that may have been extirpated. Management and monitoring are complicated by the year-to-year fluctuations in population size in response to rainfall. It is very important that surveys be during the short flowering season (before fruiting) in years of average to above-average rainfall. The inadequacy

of survey efforts is substantiated by the very recent 2011 discovery of Barstow woolly sunflower at El Mirage (MacKay, pers. comm. 2012).

Species Modeled Habitat Distribution

This section provides the results of habitat modeling for Barstow woolly sunflower, using available spatial information and occurrence information, as appropriate. For this reason, the term "modeled suitable habitat" is used in this section to distinguish modeled habitat from the habitat information provided in Habitat Requirements, which may include additional habitat and/or microhabitat factors that are important for species occupation, but for which information is not available for habitat modeling.

There are approximately 186,866 acres of modeled suitable habitat in the Plan Area. Appendix C includes a figure showing the modeled suitable habitat in the Plan Area.

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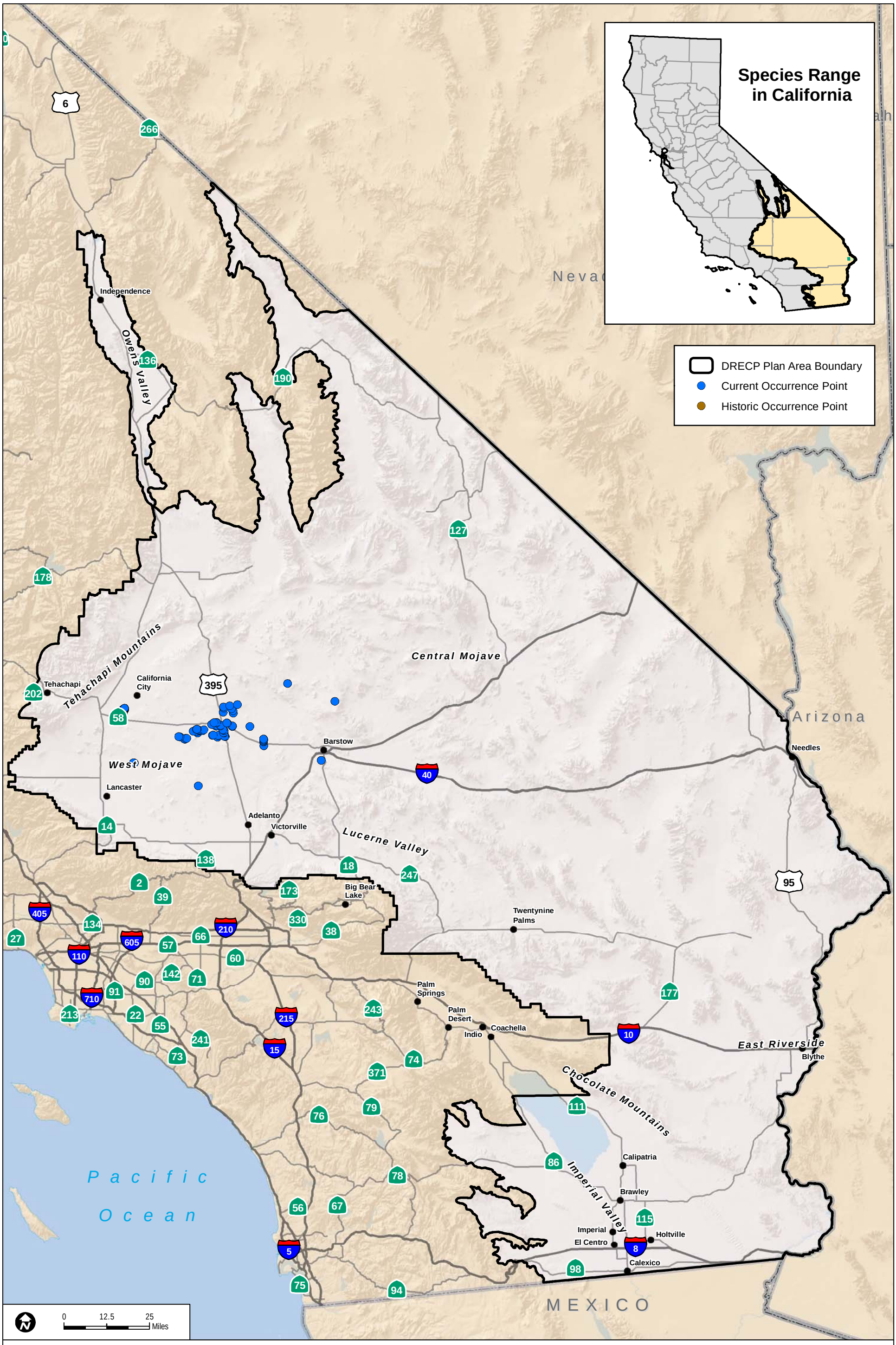

Sources: ESRI (2014); DRECP Species Occurrence Database (2013), CWHR (2008)

FIGURE SP-P03

Barstow Wolly Sunflower Occurrences in the Plan Area